

VISIT...

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DRYING AGENTS

When you've prepared a liquid product, you must dry the liquid before you finally distill and package it, by treating the liquid with a **drying agent**. Drying agents are usually certain anhydrous salts that combine with the water in your product and hold it as a **water of crystallization**. When all the water in your sample is tied up with the salt, you gravity filter the mixture. The dried liquid passes through the filter paper and the *hydrated salt* stays behind.

TYPICAL DRYING AGENTS

1. **Anhydrous calcium chloride.** This is a very popular drying agent, inexpensive and rapid, but of late I've become disappointed in its performance. It seems that the calcium chloride powders a bit upon storage and abuse, and this *calcium chloride dust* can go right through the filter paper with the liquid. So a caution: If you must use anhydrous calcium chloride, be sure it is granular. Avoid powdered calcium chloride, or granular anhydrous calcium chloride that's been around long enough to become pulverized. And don't add to the problem by leaving the lid off the jar of the drying agent; that's the abuse I was talking about.
Anhydrous calcium chloride tends to form *alcohols of crystallization*, so you really can't use it to dry alcohols.
2. **Anhydrous sodium carbonate and anhydrous potassium carbonate.** These are useful drying agents that are basically *basic*. As they dry your organic compound, any carbonate that gets dissolved in the tiny amounts of water in your sample can neutralize any tiny amounts of acid that may be left in the liquid. If your product is *supposed* to be acidic (in contrast to being *contaminated* with acid), you should avoid these drying agents.
3. **Anhydrous magnesium sulfate.** In my opinion, anh. MgSO_4 is about the best all-around drying agent. It has a drawback, though. Since it is a fine powder, lots of your water can become trapped on the surface. *This is not the same as water of crystallization*. The product is *only on the surface, not inside the crystal structure*, and you may wash your product off.
4. **Drierite.** Drierite, a commercially available brand of anhydrous calcium sulfate, has been around a long time and is a popular drying agent. You can put it in liquids and dry them or pack a drying tube

with it to keep the moisture in the air from getting into the reaction setup. But be warned. There is also *blue Drierite*. This has an indicator, a cobalt salt, that is *blue when dry, pink when wet*. Now you can easily tell when the drying agent is no good. Just look at it. Unfortunately, this stuff is not cheap, so don't fill your entire drying tube with it just because it'll look pretty. Use a small amount mixed with white Drierite, and when the blue pieces turn pink, change the entire charge in your drying tube. You can take a chance using blue Drierite to dry a liquid directly. Sometimes the cobalt compound dissolves in your product. Then you have to clean and dry your product all over again.

USING A DRYING AGENT

1. Put the liquid or solution to be dried into an Erlenmeyer flask.
2. Add *small* amounts of drying agent and swirl the liquid. When the liquid is no longer cloudy, the water is gone, and the liquid is dry.
3. Add just a bit more drying agent and swirl one final time.
4. Gravity filter through filter paper (see Fig. 59).
5. If you've used a carrier solvent, then evaporate or distill it off, whichever is appropriate. Then you'll have your clean, dry product.

FOLLOWING DIRECTIONS AND LOSING PRODUCT ANYWAY

"Add 5 g of anhydrous magnesium sulfate to dry the product." Suppose your yield of product is lower than that in the book. Too much drying agent—not enough product—Zap! It's all sucked onto the surface of the drying agent. Bye bye product. Bye bye grade.

Add the drying agent slowly to the product in small amounts.

Now about those small amounts of product (usually liquids).

1. Dissolve your product in a *low boiling point solvent*. Maybe ether or hexane or the like. Now dry this whole solution, and gravity filter. Remove the solvent carefully. Hoo-ha! Dried product.
2. Use chunky dehydrating agents like anhydrous calcium sulfate (Drierite). Chunky drying agents have a much smaller surface area, so not much of the product gets absorbed.

DRYING AGENTS: MICROSCALE

Using drying agents in microscale work follows the same rules as drying on larger scales. Chunky Drierite becomes a problem, and you may have to chop it up a bit (good luck!) before you use it. And, as ever, beware directions that command you to fill a cotton-plugged pipet (see Chapter 7, “Pipet Tips”) with exactly 2.76 g of drying agent: again, this is a *typical* amount of drying agent to be used to dry the *typical* amount of product. The one nice thing about drying your liquids this way is that you can also filter impurities out of the liquid at the same time (Fig. 41b).